REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of November 29, 2000, is respectfully requested.

In paragraph 2 of the Office Action, the Examiner rejected claims 11-24 under 35 USC §112, second paragraph, as being indefinite. In particular, the Examiner objected to the term "intensely" recited in dependent claims 12, 16, 22 and 23, objected to the term "said combustibles" recited in claims 11, 20, 21 and 24, and asserted that the phrase "flowing fluidized medium" recited in claims 12 and 22 is vague because it is unknown whether it is referring to a previously recited fluidized medium.

In view of these objections, claims 12, 16, 20 and 22-24 have been amended as shown above. In particular, the phrase "said combustibles" has been changed to "combustibles", the term "intensely" has been removed, and the term "flowing fluidized medium" has been changed to "flowing said fluidized medium." In addition, independent claims 11 and 21 have been cancelled and, therefore, dependent claims 12 and 16 have been amended to depend from claim 20, while dependent claims 22 and 23 have been amended to depend from claim 24. In view of the above amendments, it is respectfully submitted that the Examiner's formal rejections have been overcome, and that the claims now fully comply with all of the requirements of 35 USC §112.

The Examiner has rejected claims 11, 20 and 24 under 35 USC §103(a) as being unpatentable over the Hirayama reference (USP 5,620,488) in view of Japanese reference 5-23321 ("the JP '321 reference"). In addition, the Examiner has rejected independent claim 21 and several of the dependent claims has being unpatentable over the Hirayama reference in view of the JP '321 reference and further in view of Japanese reference 7-56362 ("the JP '362 reference"). However, as indicated above, independent claims 11 and 21 have been cancelled. Furthermore, for the reasons discussed below, the rejections of the remaining claims are respectfully traversed. Thus, it is submitted that independent claims 20 and 24, and the claims that depend therefrom, are clearly patentable over the prior art of record.

The present invention is directed to a fluidized-bed gasification method and apparatus for supplying gas to an adjacent melt combustion furnace at a controlled temperature. As discussed in

detail in the specification, although desirable, it is often difficult to control the temperature of the combustible gas and non-combusted particles generated during the gasification process due to the different material characteristics of the combustible products fed into a conventional fluidized-bed gasification apparatus. As a result, the temperature of the combustible gas and non-combusted particles fed to the adjoining melt combustion furnace cannot be adequately controlled.

In view of this concern, the present invention provides an improved fluidized-bed gasification apparatus in which the temperature of the generated combustible gas and non-combusted particles can be adequately controlled. Specifically, as recited in the method of claim 20 and the apparatus of claim 24, a fluidized-bed furnace is provided for gasifying combustibles in a combustion region so as to generate combustible gas and non-combusted particles. A heat recovery region is provided for recovering heat from the gasifying process, and the rate at which the heat recovery region recovers the heat is controlled. As a result, the temperature of the combustible gas generated by the fluidized-bed furnace is also controlled. Subsequently, the combustible gas and non-combusted particles are delivered to and combusted in a melt combustion furnace at the controlled temperature.

The Hirayama reference discloses a gasification and melt combustion system which is similar to the present invention. Specifically, the system of the Hirayama reference is provided in two stages - a first (low-temperature) gasification stage and a second (high-temperature) combustion stage. In the first (gasification) stage of the Hirayama reference, combustible materials are pyrolyzed, but there is no disclosure of how to control the temperature of the gasification furnace in order to generate combustible gas and non-combusted particles at a controlled temperature for delivery to the melt combustion furnace. Moreover, the Hirayama reference also does not disclose or suggest any heat recovery at the low temperature gasification stage.

Both the JP '321 reference and the JP '362 reference disclose fluidized-bed boilers. The Examiner asserts that, at least, the JP '321 reference discloses a temperature detector 91 and controller 92 to control the temperature in the fluidized-bed boiler. However, these references do not disclose a method or an apparatus in which combustibles are *gasified*, and heat is recovered *from the gasifying* at a controlled rate.

In particular, the systems disclosed in the JP '321 reference and the JP '362 reference operate in an entirely different manner than the present invention or the invention disclosed in the Hirayama reference. Specifically, these references disclose that the combustibles *are completely combusted* in the fluidized-bed boiler. Subsequently, excessive heat is recovered from the combustion gases produced in the fluidized-bed boiler.

Therefore, it is clear that the JP '362 and the JP '321 reference do not disclose or suggest recovering heat at a controlled rate *during gasification* of combustibles. Moreover, there is no motivation to combine the JP '362 reference or the JP '321 reference with the Hirayama reference because, as discussed above, these systems operate in entirely different manners. In other words, while the Hirayama reference produces a combustible gas during a first stage, the JP '362 reference and the JP '321 reference do not produce any such combustible gas, but rather completely burn the combustible material during the single combustion stage. Therefore, one of ordinary skill in the art would not be motivated to modify the Hirayama reference or to combine the references in a manner that would result in the invention recited in independent claims 20 or 24. Accordingly, it is respectfully submitted that independent claims 20 and 24, and the claims that depend therefrom, are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicants' undersigned representative.

Respectfully submitted,

Takahiro OSHITA et al.

By: _____

W. Douglas Hahm
Registration No. 44,142
Attorney for Applicants

WDH/pth
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
May 29, 2001

Version with Markings to Show Changes Made

12. (Amended) A method as claimed in claim [11] 20, wherein said fluidized-bed furnace has therein a fluidized medium, said combustion region and said heat recovery region are separated by a partition wall and are connected above and below said partition wall, said combustion region includes first and second areas adjacent to each other, and further comprising:

supplying a first fluidizing gas as an upward flow into said first area, supplying a second fluidizing gas as an upward flow into said second area, and supplying heat recovery region fluidizing gas to said heat recovery region;

controlling a mass flow of said first fluidizing gas to be smaller than a mass flow of said second fluidizing gas to create in said first area a moving bed where said fluidized medium descends and is dispersed and to create in said second area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and

flowing said fluidized medium from said combustion region over said partition wall into said heat recovery region, and returning said fluidized medium in said heat recovery region to said combustion region; and

said controlling comprises adjusting said supplying said heat recovery region fluidizing gas to said heat recovery region.

16. (Amended) A method as claimed in claim [11] 20, wherein said fluidized-bed furnace has a substantially circular cross-sectional shape and has therein a fluidized medium, said combustion region comprises a circular central region, said heat recovery region comprises an outer peripheral region, said combustion region and said heat recovery region are separated by a partition wall and are connected above and below said partition wall, said combustion region includes central and peripheral areas adjacent to each other, and further comprising:

supplying a central fluidizing gas as an upward flow into said central area, supplying a peripheral fluidizing gas as an upward flow into said peripheral area, and supplying heat recovery region fluidizing gas to said heat recovery region;

controlling a mass flow of one of said central fluidizing gas and said peripheral fluidizing gas to be smaller than a mass flow of the other of said peripheral fluidizing gas and said central fluidizing gas, to create in one of said central area and said peripheral area a moving bed where said fluidized medium descends and is dispersed and to create in the other of said peripheral area and said central area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and

flowing said fluidized medium from said combustion region over said partition wall into said heat recovery region, and returning said fluidized medium in said heat recovery region to said combustion region; and

said controlling comprises adjusting said supplying said heat recovery region fluidizing gas to said heat recovery region.

20. (Amended) A method of treating combustibles, said method comprising:

gasifying [said] combustibles in a combustion region of a fluidized-bed furnace, thus generating combustible gas and non-combusted particles;

recovering heat from said gasifying in a heat recovery region of said fluidized-bed furnace;

controlling a rate of said recovering in said heat recovery region; and

delivering said combustible gas and non-combusted particles to a melt combustion furnace and therein combusting said combustible gas and melting non-combustible ash of said non-combusted particles.

22. (Amended) An apparatus as claimed in claim [21] 24, wherein said fluidized-bed furnace has therein a fluidized medium, said combustion region and said heat recovery region are separated by a partition wall, said combustion region includes first and second areas adjacent to each other, and further comprising:

an air diffusion device to supply a first fluidizing gas as an upward flow into said first area, to supply a second fluidizing gas as an upward flow into said second area, and to supply heat recovery region fluidizing gas to said heat recovery region, said air diffusion device being structured such that a mass flow of said first fluidizing gas is smaller than a mass flow of said second fluidizing gas to create in said first area a moving bed where said fluidized medium descends and is dispersed and to create in said second area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and wherein

said combustion region and said heat recovery region are connected above and below said partition wall, to allow said fluidized medium from said combustion region to flow over said partition wall into said heat recovery region;

said heat recovery surface comprises a member in said heat recovery region for a medium to pass therethrough; and

said air diffusion device includes a heat recovery region air diffuser at a bottom of said heat recovery region, said heat recovery air diffuser being structured to adjust the supply of said heat recovery region fluidizing gas to said heat recovery region to cause [the] said fluidized medium in said heat recovery region to descend therein as a moving bed and to circulate therefrom below said partition wall back to said combustion region.

23. (Amended) An apparatus as claimed in claim [21] 24, wherein said fluidized-bed furnace has a substantially circular cross-sectional shape and has therein a fluidized medium, said combustion region comprises a circular central region, said heat recovery region comprises a peripheral region, said combustion region and said heat recovery region are separated by a partition wall, said combustion region includes central and peripheral areas adjacent to each other, and further comprising:

an air diffusion device to supply a central fluidizing gas as an upward flow into said central area, to supply a peripheral fluidizing gas as an upward flow into said peripheral area, and to supply heat recovery region fluidizing gas to said heat recovery region, said air diffusion device being structured such that a mass flow of one of said central fluidizing gas and said peripheral fluidizing gas is smaller than a mass flow of the other of said peripheral fluidizing gas and said central fluidizing gas

to create in one of said central area and said peripheral area a moving bed where said fluidized medium descends and is dispersed and to create in the other of said peripheral area and said central area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and wherein

said combustion region and said heat recovery region are connected above and below said partition wall, to allow said fluidized medium from said combustion region to flow over said partition wall into said heat recovery region;

said heat recovery surface comprises a member in said heat recovery region for a medium to pass therethrough; and

said air diffusion device includes a heat recovery region air diffuser at a bottom of said heat recovery region, said heat recovery air diffuser being structured to adjust the supply of said heat recovery region fluidizing gas to said heat recovery region to cause [the] said fluidized medium in said heat recovery region to descend therein as a moving bed and to circulate therefrom below said partition wall back to said combustion region.

24. (Amended) An apparatus for treating combustibles, said apparatus comprising:

a fluidized-bed furnace having a combustion region for gasifying [the] combustibles, thus generating combustible gas and non-combusted particles, and a heat recovery region for recovering heat from said gasifying;

a heat recovery surface for controlling a rate of said recovering in said heat recovery region; and

a melt combustion furnace for receiving the combustible gas and the non-combusted particles and for combusting the combustible gas and melting non-combustible ash of the non-combusted particles.